



299-E33-20

Log Data Report

Borehole Information:

Borehole: 299-E33-20		Site: 216-B-11B Injection Well			
Coordinates		GWL (ft)¹:	250.76 ft	GWL Date:	04/00
North	East	Drill Date	TOC² Elevation	Total Depth (ft)	Type
137,398.11	573,847.82	05/56	640.08	254.0	cable tool

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inner Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
carbon steel	0	8.64	8.0	0.322	0	254
carbon steel	1.25	6.56	6.0	0.280	0	234
unknown	0	6.56	6.0	0.280	234	239
stainless steel (#10 slot)	0	unknown	unknown	0.280 (assumed)	239	254

Borehole Notes:

The borehole and casing information provided above is derived from *Hanford Wells* (Chamness and Merz 1993). The depth information is referenced to the top of casing that in the past (i.e., 1993) was about 1.25 ft above ground surface. At the time of logging, casing stickup was measured at 3 ft above ground surface and was the zero reference for logging. It is not known if casing was added or the ground surface has been lowered causing the discrepancy. Therefore, the logging depth may not match the depths from previous logs provided above and should be adjusted upward 1.75 ft. The 8-in.-inside diameter (ID) and 6-in. ID casings are assumed to be 0.322 in. and 0.28 in. thick, respectively. These values are the published thickness for ASTM schedule-40 steel pipe, a common casing material used at Hanford. The stainless steel screen is reported to be 6 in. but is probably a slightly smaller diameter than the 6-in. casing from which it telescoped.

It is reported that the original 8-in. casing was perforated from 225 to 252 ft with five perforations per foot at the time of drilling in 1956. During 1983, modifications were made to provide a surface seal and to install a slotted stainless steel screen to measure the groundwater. A screen was set between 239 and 254 ft telescoped from a 6-in. steel casing that is currently at ground surface. Pea gravel and a fine sand filter pack were emplaced around and above the screen from 225 to 254 ft. The 8-in. casing was perforated during the modifications from 0-60 ft and 75-120 ft. Presumably grout was then introduced into the annular space between the 6- and 8-in. casings from 225 ft to the ground surface. The grout was probably also forced into the formation through the 8-in. casing perforations to complete the seal.

The groundwater level data is derived from *Hanford Site Groundwater Monitoring for FY 2000* (PNNL-13404).

Logging Equipment Information:

Logging System:	Gamma 2B	Type:	SGLS (35%)
Calibration Date:	09/00	Calibration Reference:	09/00
	Logging Procedure: MAC-HGLP 1.6.5		

Log Run Information:

Log Run	1	2	3	4	
Date	06/18/01	06/19/01	06/20/01	06/21/01	
Logging Engineer	Musial/Spatz	Musial/Spatz	Musial/Spatz	Musial/Spatz	
Start Depth	248.0	198.0	0.0	106.5	
Finish Depth	197.0	105.5	63.5	62.5	
Count Time (sec)	100	100	100	100	
Live/Real	L	L	L	L	
Shield (Y/N)	N	N	N	N	
MSA Interval (ft)	0.5	0.5	0.5	0.5	
ft/min	n/a	n/a	n/a	n/a	
Pre-Verification	B0003CAB	B0004CAB	B0005CAB	B0006CAB	
Start File	B0003000	B0004000	B0005000	B0006000	
Finish File	B0003102	B0004185	B0005127	B0006088	
Post-Verification	B0003CAA	B0004CAA	B0005CAA	B0006CAA	

Logging Operation Notes:

Logging occurred on four separate days. Logging was terminated approximately 2 ft above the latest reported groundwater level so that the logging sonde and cable would not potentially become contaminated. No repeat section was performed in this borehole.

Analysis Notes:

Analyst:	Henwood	Date:	08/11/01	Reference:	MAC-VZCP 1.7.9 Rev. 2
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Pre-run and post-run verification of the logging tool were performed for each day's log event. The post-run verification for log runs 1 and 3 failed at least one of the acceptance criteria. The peak counts per second for the 2614-keV peak were below the lower control limit. Examination of spectra indicates the detector appears to be functioning normally and the log data are provisionally accepted. The pre-verification spectra collected were used for the energy and resolution calibration for the data processing in log runs 1 and 3.

Each spectrum collected during a log run was processed in batch mode using APTEC SUPERVISOR to identify individual energy peaks and determine count rates. Concentrations were calculated with EXCEL using an efficiency function and corrections for casing and dead time established during calibration of the logging system.

Log Plot Notes:

Separate log plots are provided for man-made radionuclides (^{137}Cs and ^{60}Co), naturally occurring radionuclides (^{40}K , ^{232}Th , ^{238}U [KUT]), and a combination of man-made, KUT, total gamma, and dead time. For each radionuclide, the energy value of the spectral peak used for quantification is indicated. Unless otherwise noted, all radionuclides are plotted in picocuries per gram (pCi/g). The open circles

indicate the minimum detectable limit (MDL) for each radionuclide. Error bars on each plot represent error associated with counting statistics only and do not include errors associated with the inverse efficiency function, dead time correction, or casing corrections. These errors are discussed in the calibration report.

In the combination plot, dead time is included. Concentrations of all radionuclides in depth intervals where the dead time exceeds about 40% may be underestimated slightly. The maximum dead time encountered was less than 2% percent, in which case no dead time correction is applied.

Data overlaps collected between successive log runs (62.5-63.5 and 97-98 ft) indicate good agreement, demonstrating good repeatability in both depth and measurement.

Results and Interpretations :

^{137}Cs and ^{60}Co were detected in this borehole. ^{137}Cs was detected between about ground surface and 10 ft, at 88 ft, between 189 and 197 ft, and below 240 ft in depth. The highest ^{137}Cs concentrations measured about 40 pCi/g at 8 and 88 ft. ^{60}Co is measured at about 120, 132, 221, and below 243 ft at low concentrations (i.e., less than 0.3 pCi/g).

The ^{137}Cs contamination near the ground surface is probably the result of spills. The origin of the ^{137}Cs and ^{60}Co contamination that are detected at various locations is unknown.

The depths below 240 ft, where ^{137}Cs and ^{60}Co are detected, coincide with the historical water levels. The depth to water has been reported as 243 ft in July 1956, 234 ft in November 1989, and 250.76 ft in April 2000. Logging was terminated above the latest reported groundwater level. An injection/reverse well is located approximately 15 ft northeast of this borehole and liquid effluent injected into the well likely caused a mound of water that has since receded, leaving contaminated soils in the vicinity.

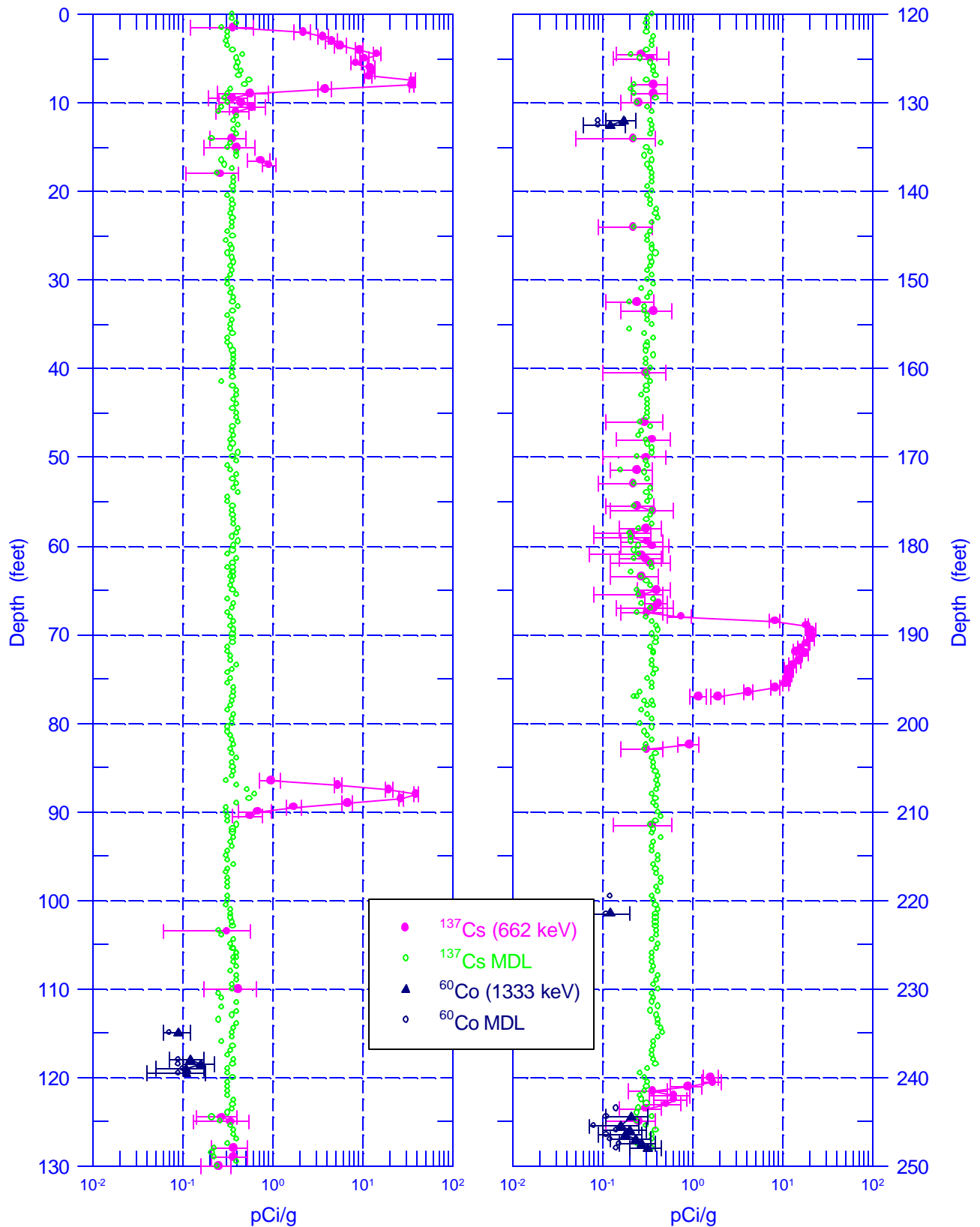
The KUT logs may indicate potential lithologic changes. However, the presence of dual casing and variations in annular grout affect spectral gamma response. Observed variation in the KUT logs are not necessarily indications of stratigraphic changes.

¹ GWL – groundwater level

² TOC – top of casing

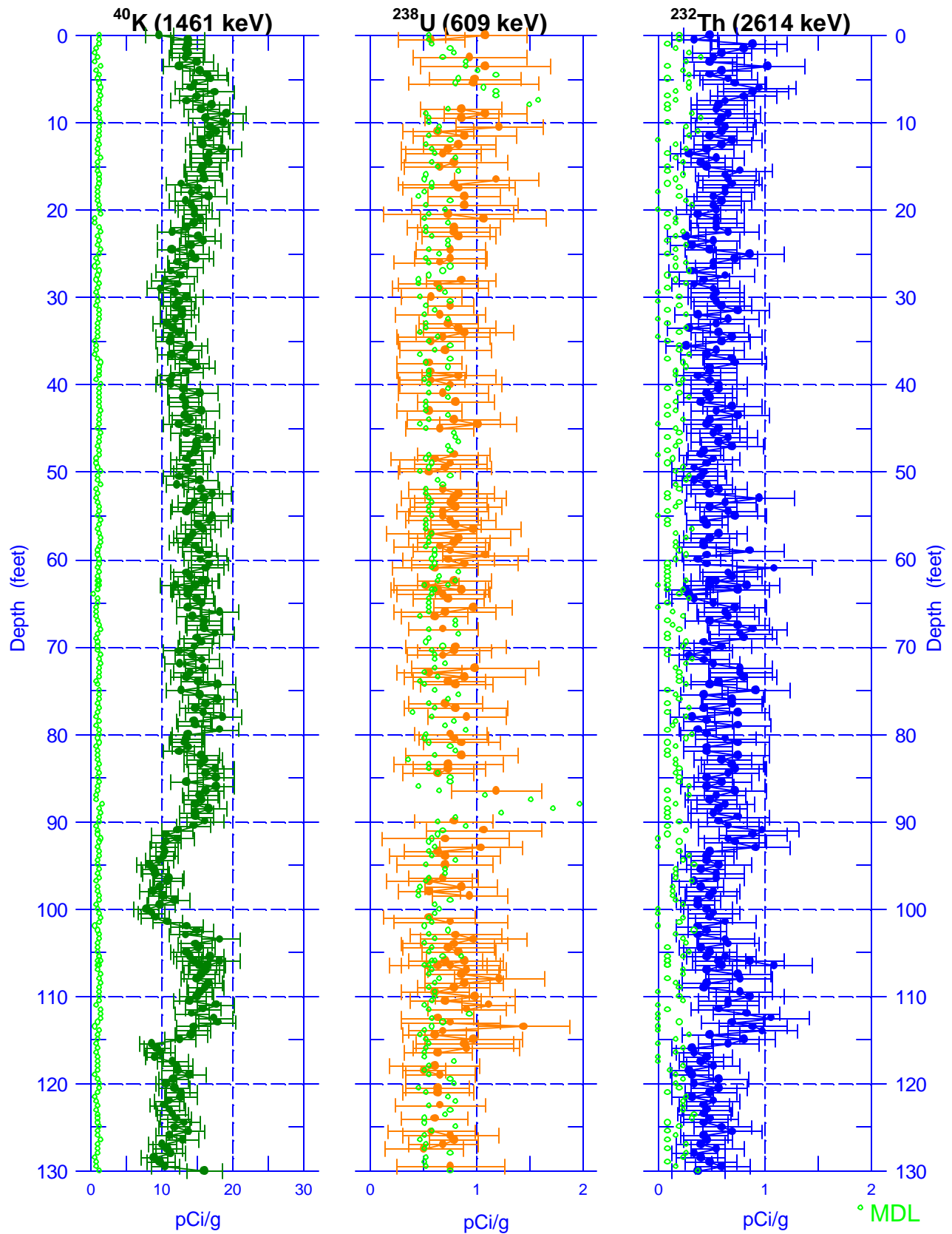
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Man-Made Radionuclide Concentrations



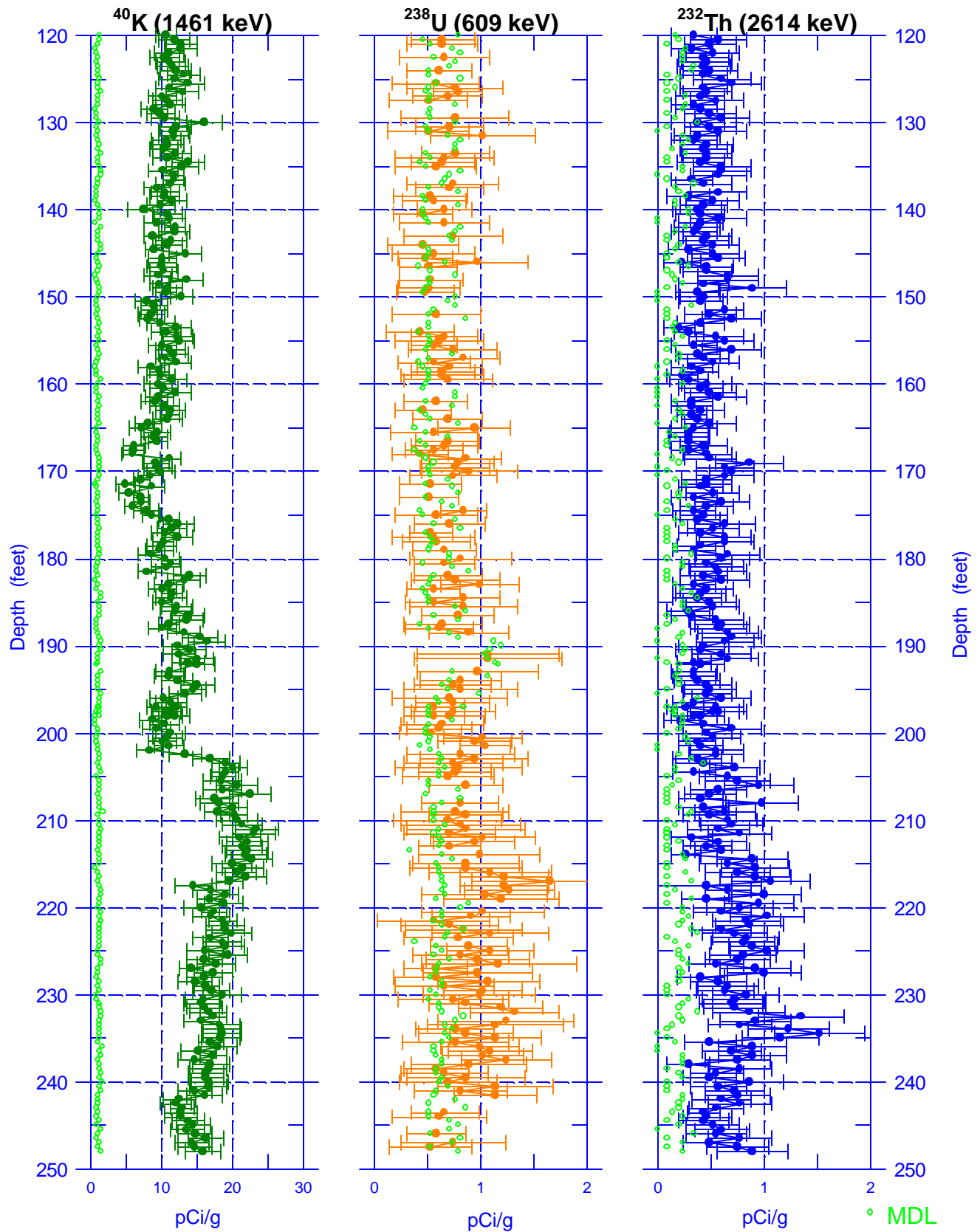
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Natural Gamma Logs

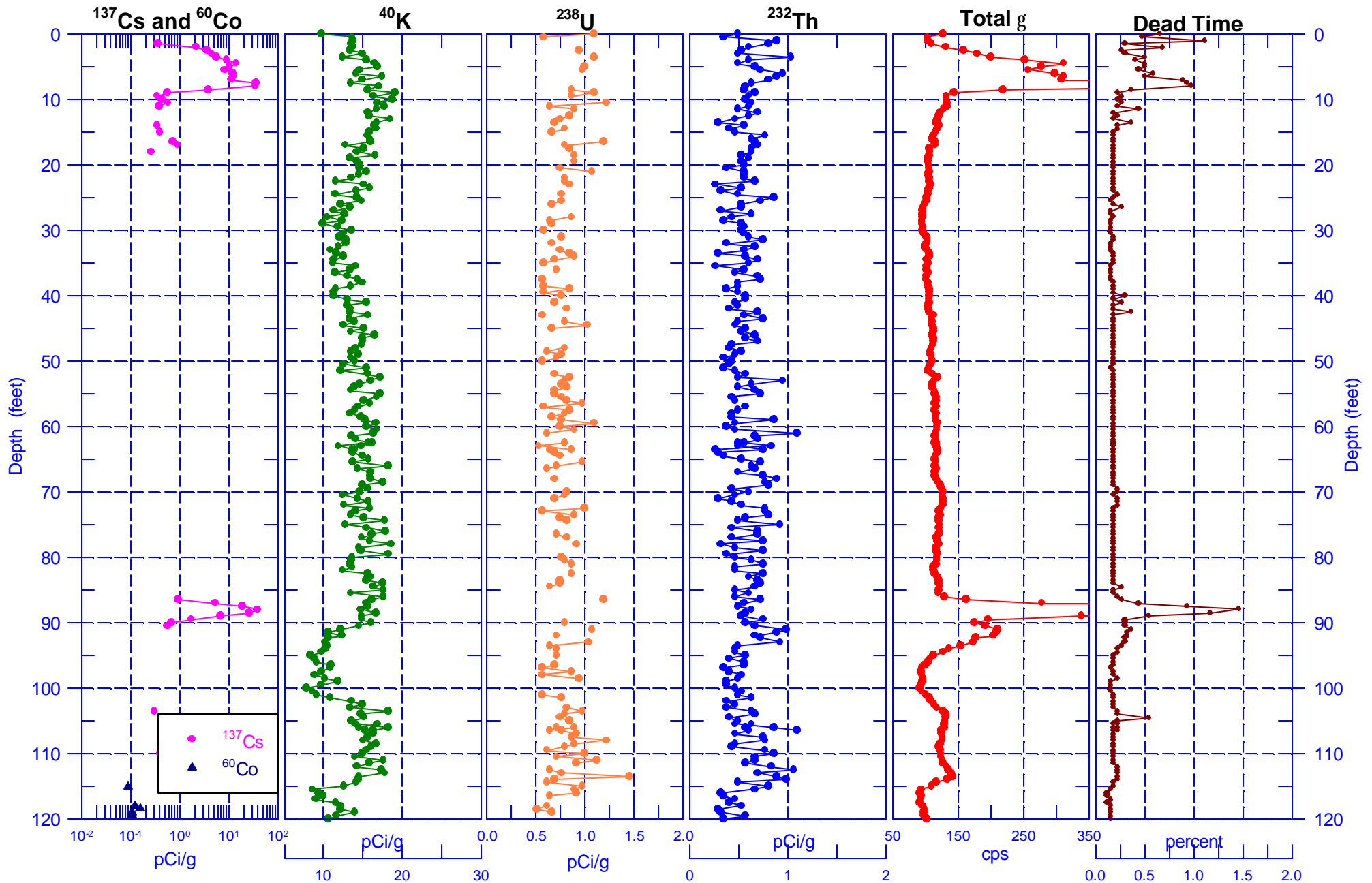


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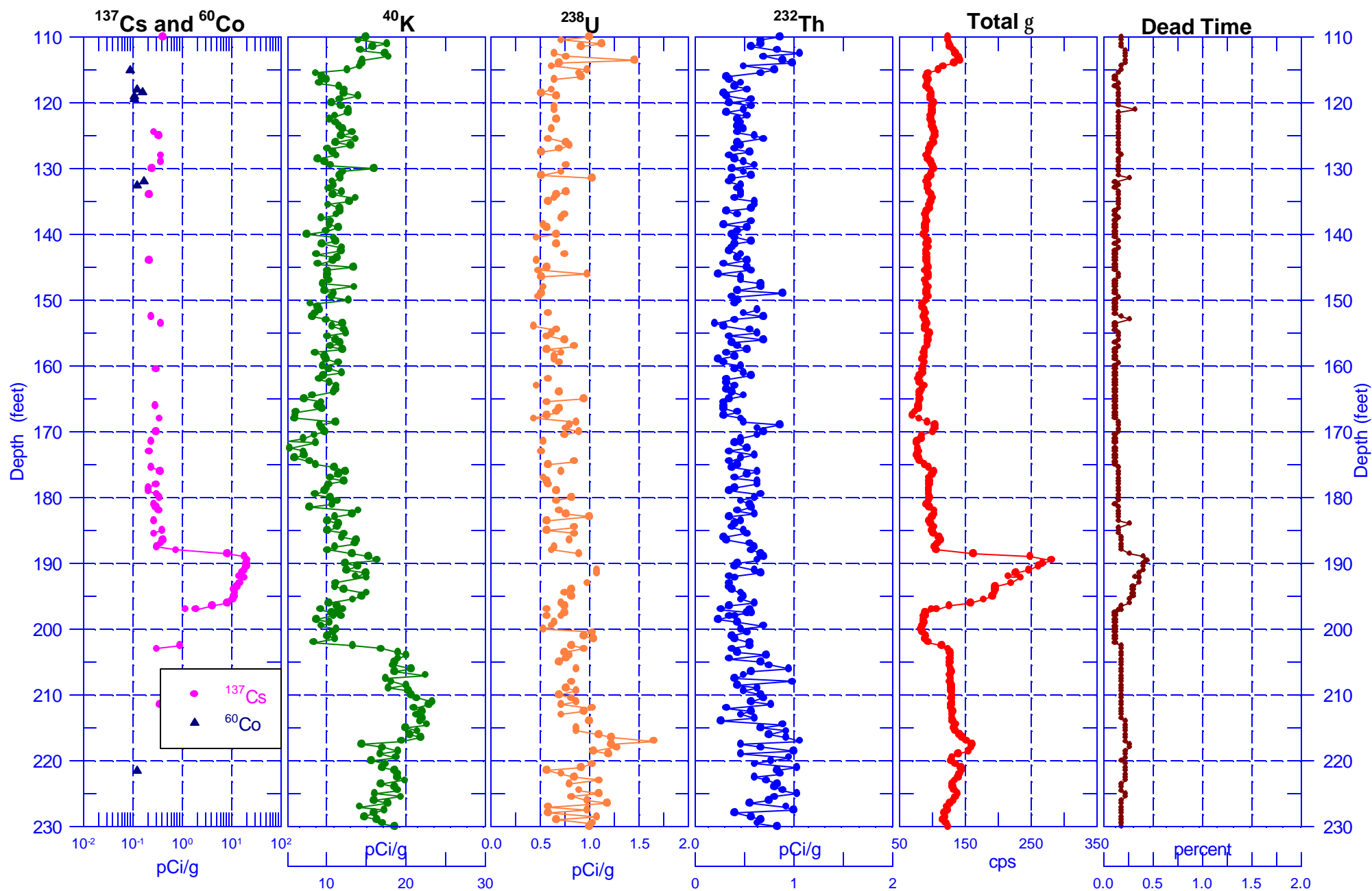
Natural Gamma Logs



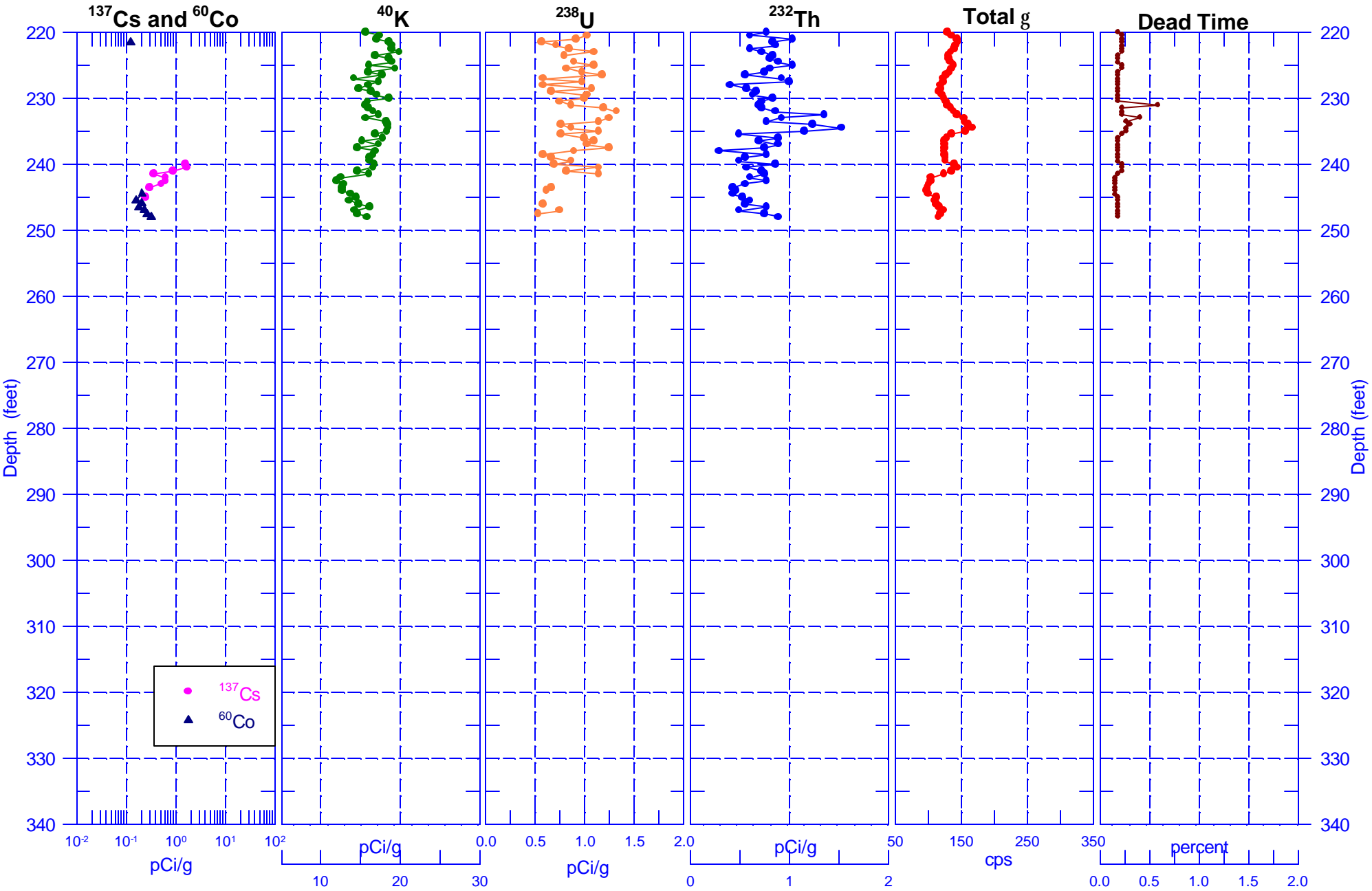
299-E33-20 Combination Plot



299-E33-20 Combination Plot



299-E33-20 Combination Plot



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